Ecological Services of Weeds:
Weed management with wildlife in mind

John Vickery & Megan Bowes

Denver Chapter Meeting
October 2011
Colorado Native Plant Society

Education & Outreach Committee

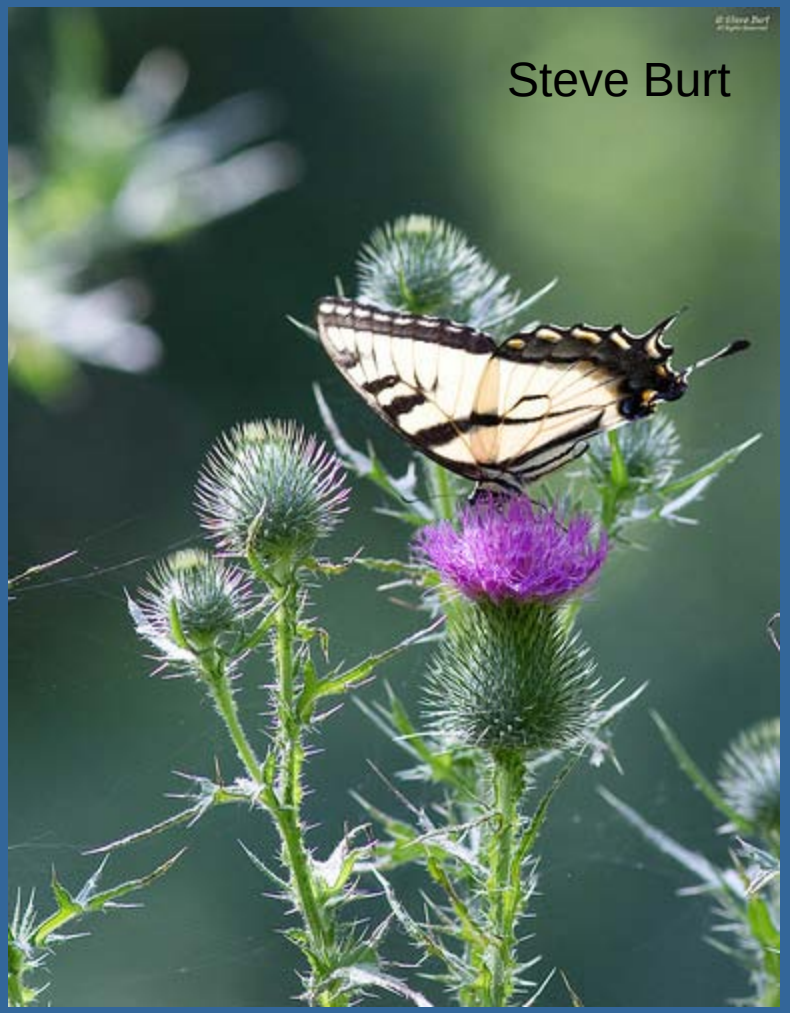
Colorado Native Plant Society

Studying, enjoying and protecting
the native plants of Colorado

Ecological Services of Weeds: Overview

Non-native plants (weeds or otherwise) can be important for native animals:

- food
  - direct consumption
  - through food chain/web
- shelter, cover, shade
- nesting/denning material or sites
- perch & roost sites



ES in Public Policy Circles: Valuation & Compensation Schemes

Categories of Ecosystem Services include:

- Provisional
  - food, water, fiber
- Regulating
  - carbon sequestration, waste decomposition, air purification, erosion, temperature
- Supporting
  - nutrient dispersal and cycling, primary productivity
- Cultural
  - religious, recreation

Worldwide estimate: $16 to $54 trillion/year

Weeds in black and red

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Provisional
food, water, fiber

Regulating
carbon sequestration, waste decomposition, air purification, erosion, temperature

Supporting
nutrient dispersal and cycling, primary productivity

Cultural
religious, recreation

Worldwide estimate
$16 to $54 trillion/year

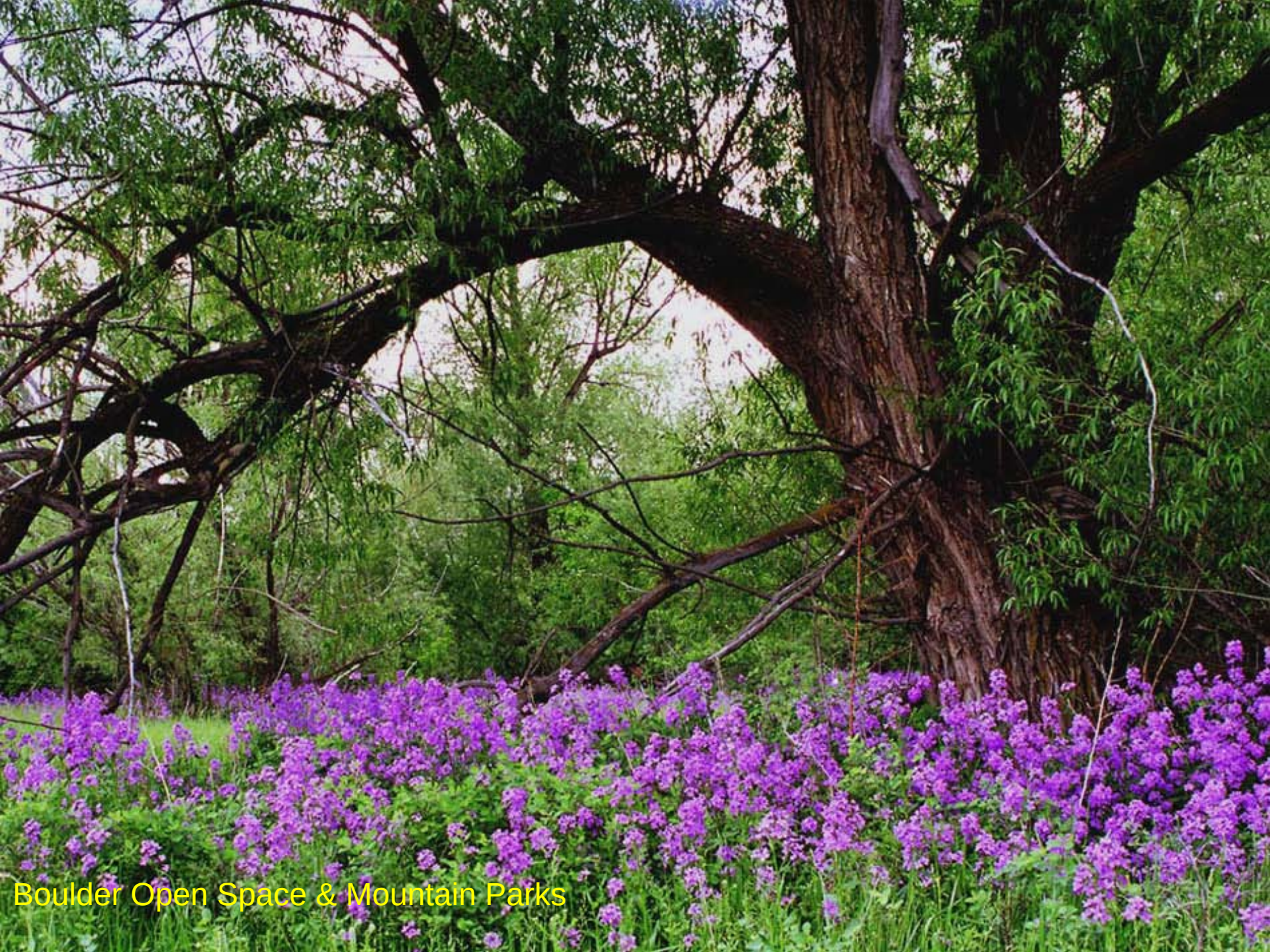
Stephen Young
Weed ecologist
West Central Research and Extension Center
University of Nebraska-Lincoln

(North American Invasive Plant Species Ecology and Management Short Course)

Soil and Water Conservation Society Conference Symposium:
Ecosystem Services - T**he Significance of Contributions by Invasive Plant Species**
July 19, 2010

Viewpoint:
What contributions are invasive plant species making to ecosystem services?
JSWC 65:2.31-32A

Colorado Native Plant Society


Boulder Open Space & Mountain Parks

Weed management includes . . .

Dual goals

The impacts of weed control and VM activities on wildlife—both native vertebrate and invertebrates –can be ameliorated via a working framework of “dual goals”:

1) the driving purpose for the management activity
2) wildlife habitat OR

   plant utilization by animals

   [ecological services provided by plants]


‘Jim Gilbert, Courtesy of Conserve Wildlife Foundation of NJ

Driving purposes

Driving purposes include economic and VM activities such as

- Livestock grazing
- Ditch clearance
- Power transmission, utility ROW maintenance
- Road and trail ROW maintenance
- Invasive plant control/weed management
- Habitat improvement, VM for wildlife


Pinelands Commission, NJ


Boulder Open Space & Mountain Parks

2nd goal: wildlife

The second goal is to

reduce the negative impacts of the driving purpose and (in some cases),

improve wildlife habitat

- vertebrates
- invertebrates
- terrestrial
- aquatic
- amphibian

Two goals?

→Modifications

The second goal can often be achieved by modifying the

- **Timing**
- **Intensity**
- **Proportion**
- **Scale**

of weed & vegetation management activities

Management modifications: Timing

Generally best to carry out VM:

- During absence from
  - Site: Before, after migration
  - Land: e.g., amphibious invert & vertebrates
- During times of inactivity
  - Diapause, pre-hatch
  - Pre-emergence--when they are still in burrow, den, hive, nest (e.g., underground_ etc.
  - Dormant season, winter
  - Inactive portion of the day (light, temp)
- Before they are especially active or site-invested, mating & nesting season (e.g., birds)
- After fledging or otherwise more mobile (e.g., ground nesting birds)

Standard modifications

- **Timing** Where possible, these activities should be carried out when animals are not present or not active.
- Practioners may need to reduce the **intensity or degree** of the activity:
  - the duration and level of livestock grazing
  - the mowing height, or
  - the temperature and duration of a prescribed burn
  - the portion of the weeds present that are targeted
- **Proportion** Usually, only a part of the land to be managed or a portion of a particular vegetation community or habitat should be treated at any one time.
- **Keep in mind: Scale** Single site, multiple sites in jurisdiction, local area/multiple jurisdictions, region, river basin, ecoregion, etc.

  [inter-relation with 'proportion']

ES of weeds
Examples & management modifications

Weeds are utilized by animals in a variety of ways:

- Food
  - Direct
  - Food chain
- Shelter, cover, shade
- Nest or den material or sites
- Perch, roost, forage sites

Craig A. Mullenbach

Craig A. Mullenbach

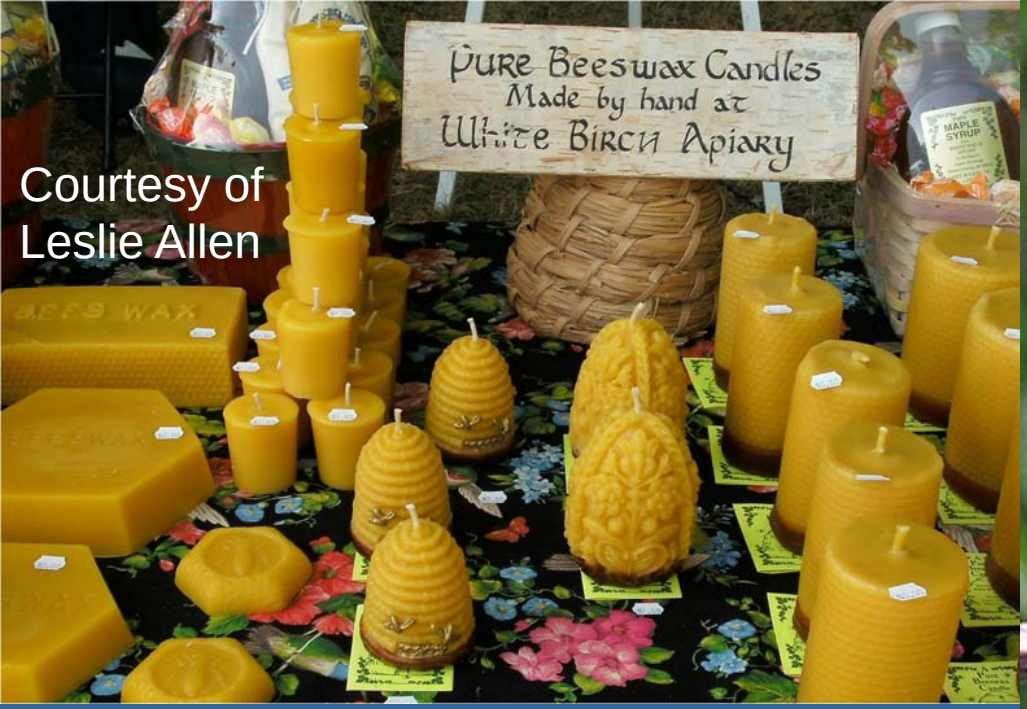
Kennedy Ball fields Complex/
'Natural Areas East'

Southeast Denver

Kennedy Soccer Complex/Natural Areas West, Denver

Paul Hentzell Natural Area, Denver

Food, direct: pollen, nectar



Courtesy of Leslie Allen


Courtesy of Jim Kloek

"By July the bees are making the honey that McBean will harvest. They're wiping their feet on and sipping nectar from trefoil, wild sweet clover, basswood, and spotted knapweed, the flowers that bloom all around town, north and south of Bruce Crossing." [Upper Peninsula, MI]

"The honey from spotted knapweed has a buttery flavor." (Jim Kloek)


Courtesy of Jim Kloek

Biocontrol agents for spotted knapweed

1.Root feeding weevil, *Cyphlocleonus achates* &

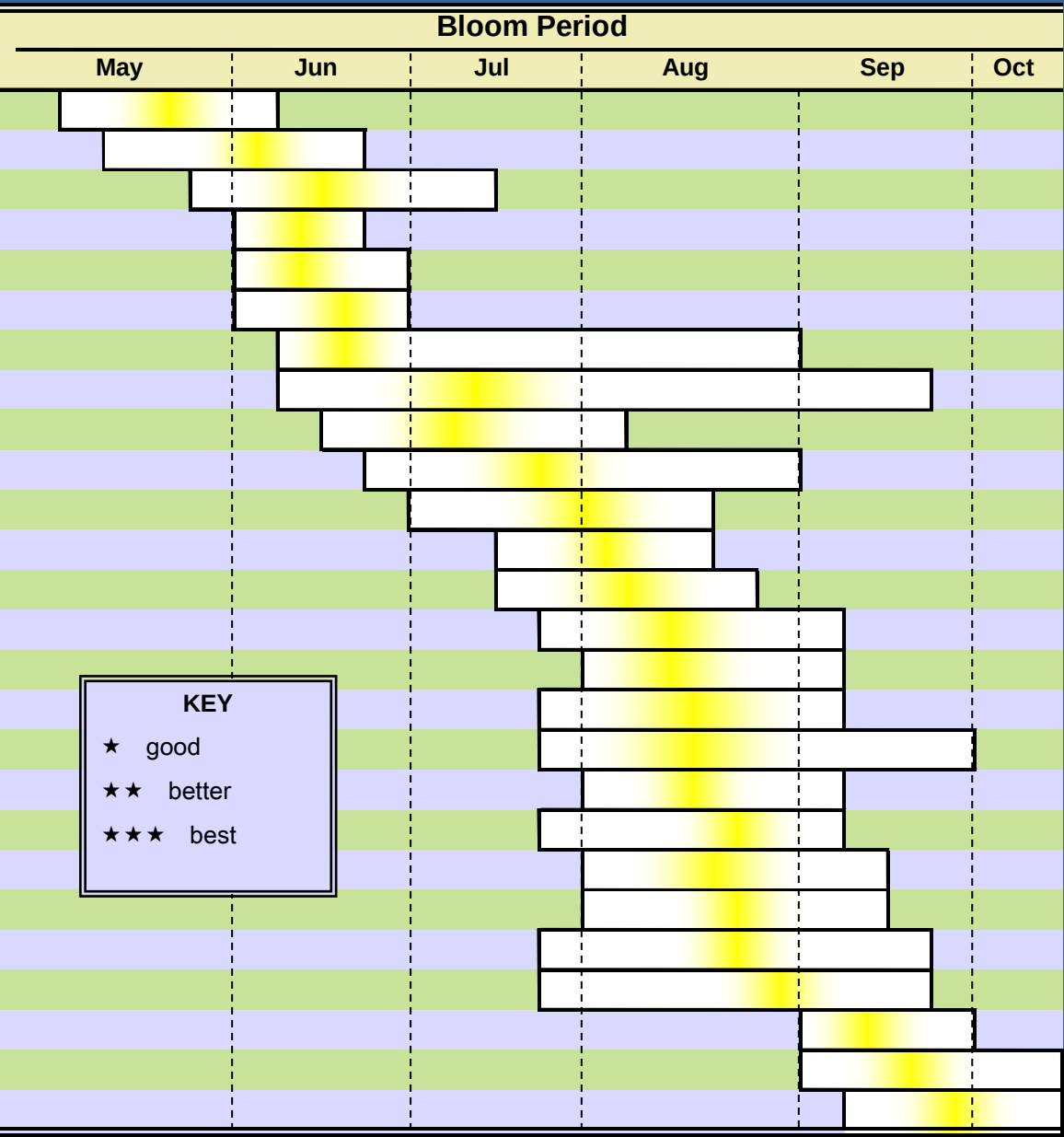
2. Seedhead weevil, *Larinus minutus*

Successful in achieving suppression in BC, MT, CO; MN, WI

For more info: LandisLab
Michigan State University
http://nativeplants.msu.edu/

Table source: Fiedler et al. 2008
Michigan State Univ. Extension Bulletin E-2973

Native plant	Natural enemies	Bees
wild strawberry	★★	★
golden Alexanders	★★★	★★
Canada anemone	★★★	★
penstemon	★★	★★
angelica	★★★	★
cow parsnip	★★★	★
sand coreopsis	★★★	★
shrubby cinquefoil	★★★	★
Indian hemp	★★★	★
late figwort	★★	★★
swamp milkweed	★★	★★
Culver's root	★★	★★★
yellow coneflower	★★★	★★
nodding wild onion	★	★★
meadowsweet	★★★	★★
yellow giant hyssop	★★	★★★
horsemint	★★★	★★
Missouri ironweed	★★	★★
cup plant	★★★	★★★
pale Indian plantain	★★	★★
boneset	★★★	★★
blue lobelia	★★★	★★★
pale-leaved sunflower	★★★	★★
Riddell's goldenrod	★★★	★★★
New England aster	★★★	★★
smooth aster	★★	★★



How do we control the knapweed while maintaining the honeybee industry? (honey production & pollination services)

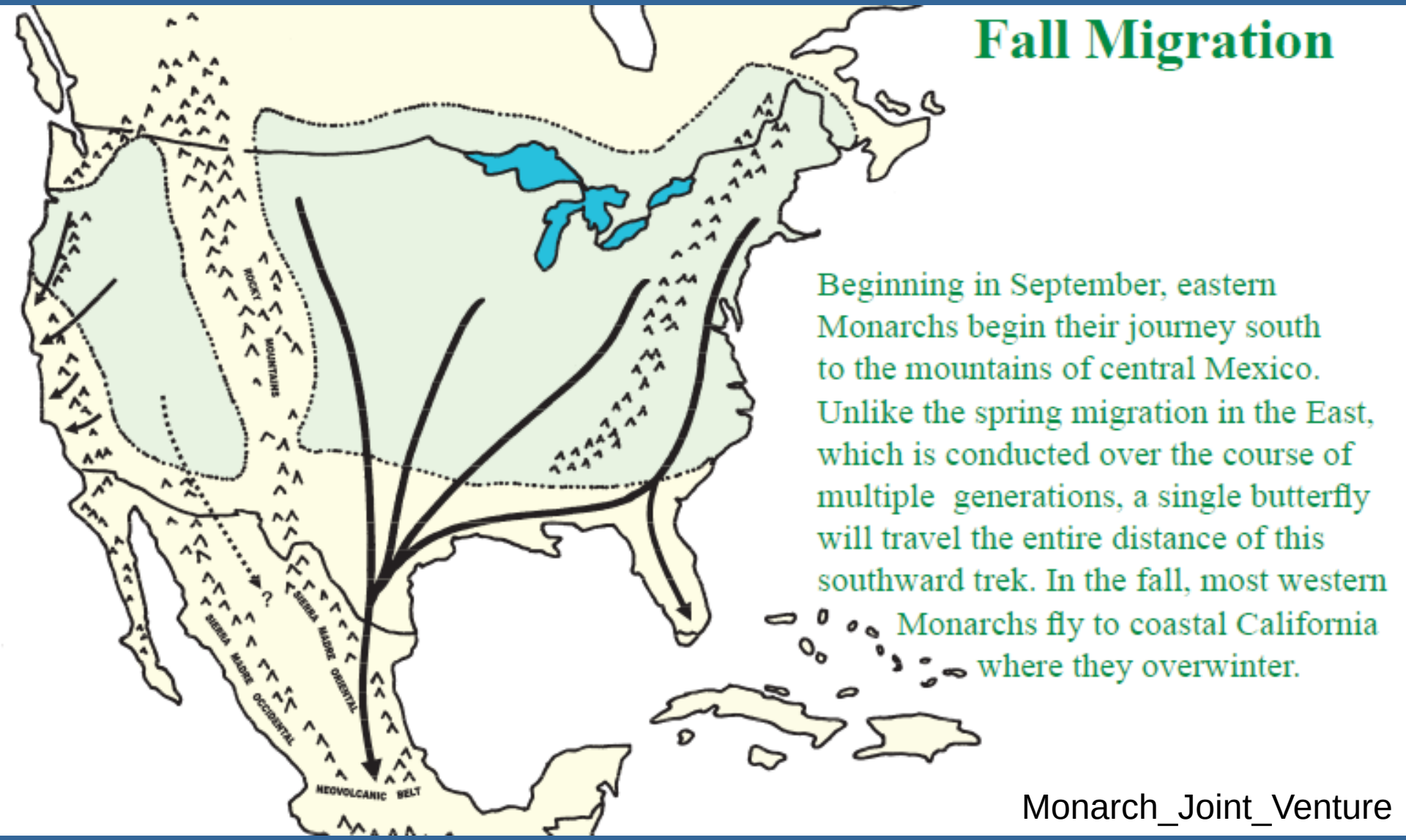
Which modification is most apt?

- Timing
- Intensity
- Proportion
- Scale

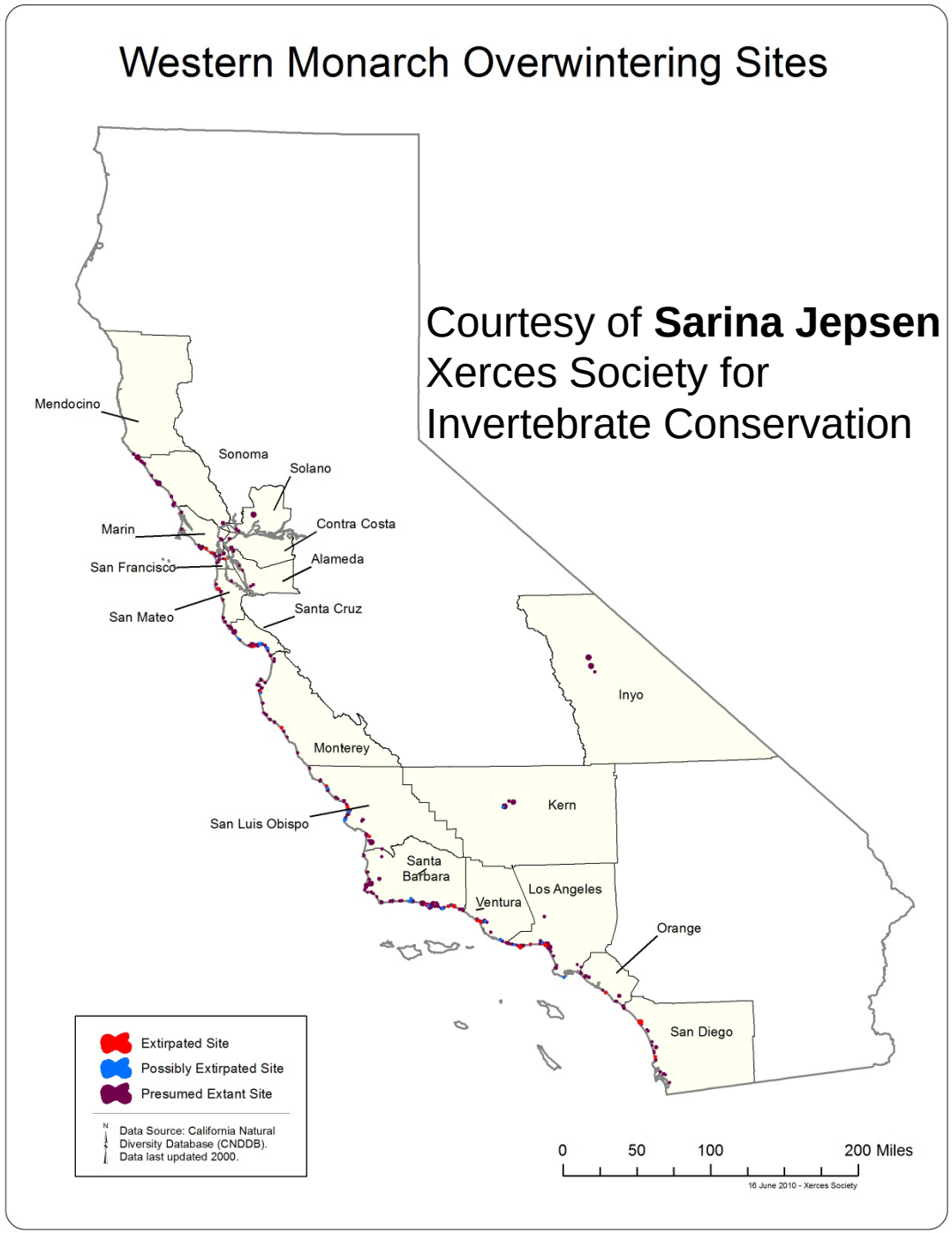
Courtesy, San Rafael Valley Grass-Fed Beef

Ecological Services of Weeds—Shelter/Cover

International Union Conservation of Nature and Natural Resources 1983 classified the migration and overwintering behavior of the Monarch butterfly as a **“Threatened Phenomenon”**



Monarch_Joint_Venture



Monarch butterfly

The only insect listed, Bonn Convention on the Conservation of Migratory Species of Wild Animals

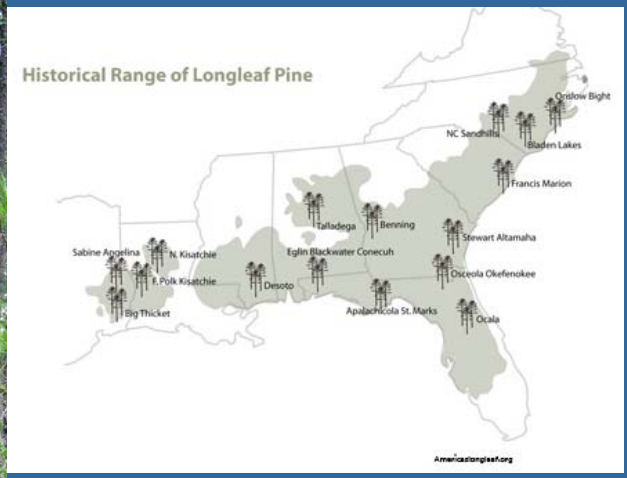
Ecological Services of Weeds—Shade, Shelter/Cover, & more

Louisiana pine snake

Craig Rudolph,
USDA Forest Service

Photo by Kelly Breland,
courtesy of Jay Eubanks

John, Elbert L. Jr. 1971,
Atlas of United States Trees

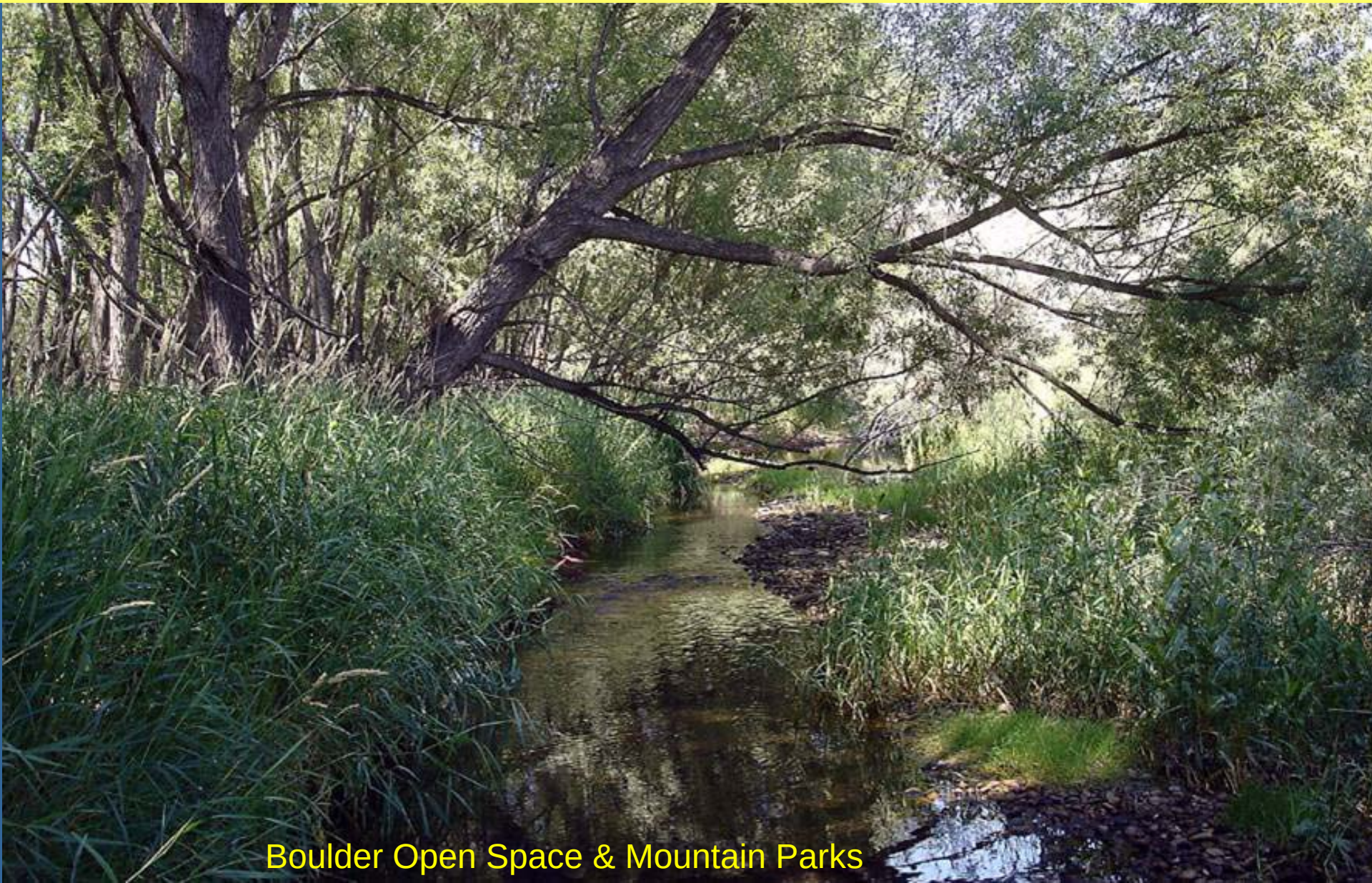


flatwoods salamander

via discoverlife.org;

Ecological Services of Weeds—Shade

Terrestrial shade: aquatic temperature regulation



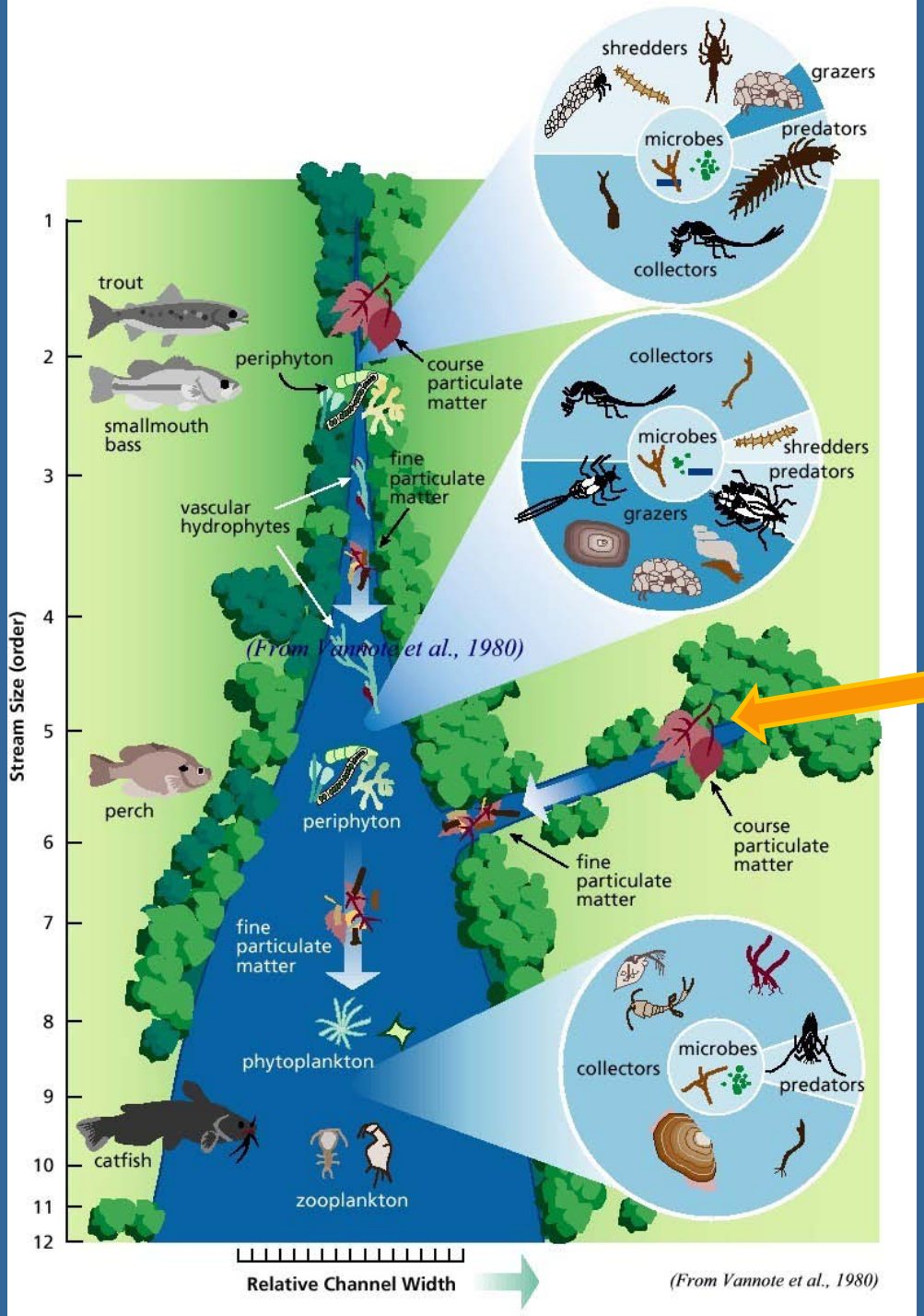


Photo by Rich Merritt

Stonefly, Plecoptera
Mostly shredders
Some predators, collectors, grazers

Ecological Services of Weeds—Nesting/Denning Material or Sites

Non-native plants can be important for native animals:

- Nesting / denning material &/or sites
- Breeding habitat, migratory birds

Ecological Services of Weeds—Nesting/Denning Material or Sites

Photo:
Tom Dudley

10.4.10 email from CDOW field staff:
“I thought of Long eared Owls and Magpies that love to nest in salt cedar stands.”

Salt cedar/Tamarix:
Colorado List B
Noxious Weed

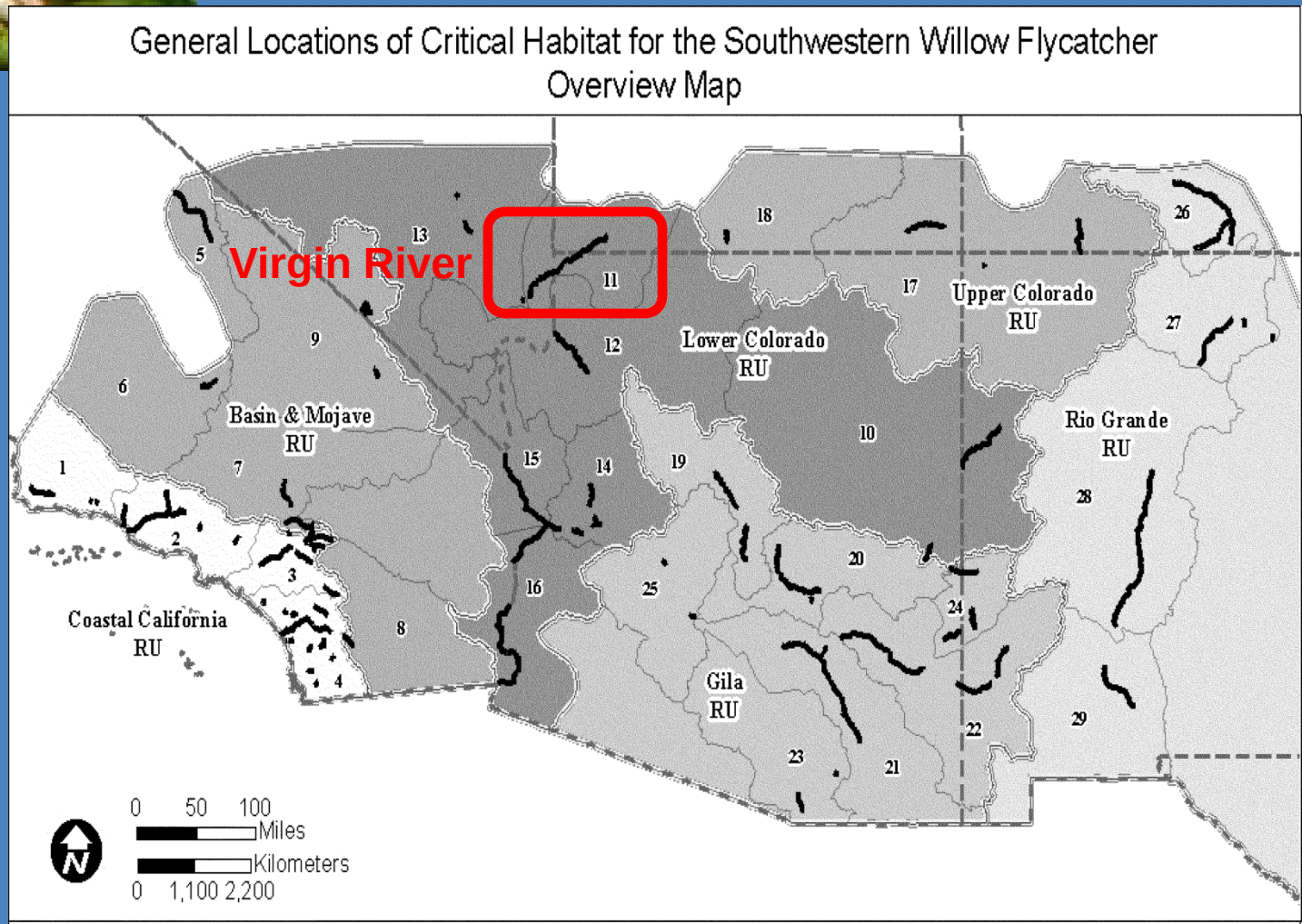
Jim Rorabaugh, USFWS

Photo by USGS

Classic Invasives Management Catch 22:

a weed as endangered species habitat

Colorado River Water Users Association



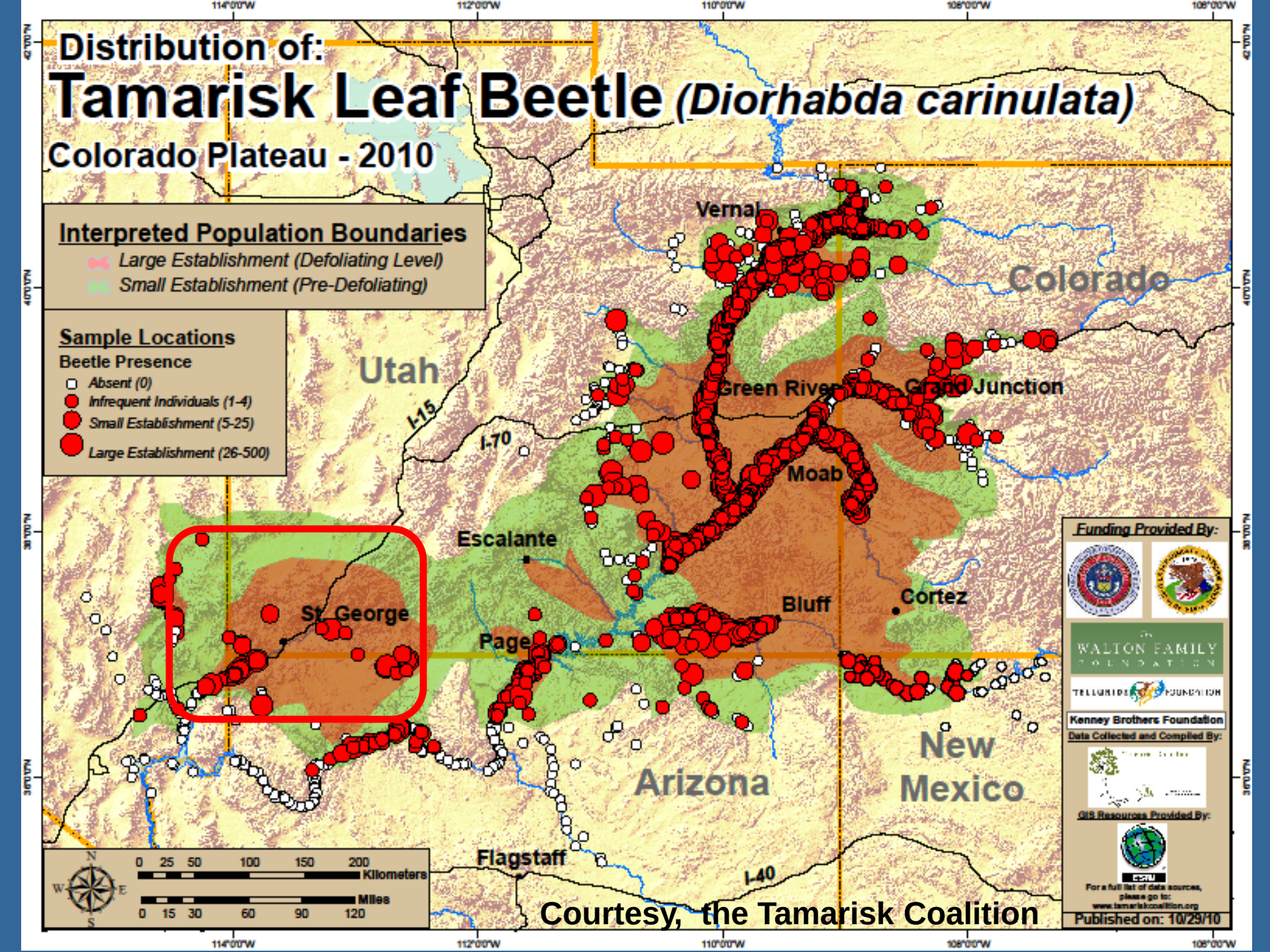
US FWS

Catch 22 Update, 2010

June 2010
USDA-APHIS
enacted a Moratorium for
Biological Control of
Saltcedar (*Tamarix* species);
Prohibits the use of the
biological control agent
Diorhabda leaf beetle for
further introductions,
release, and
transport by any party
for any purpose.

Diorhabda elongata leaf beetle
Host: Tamarix spp.

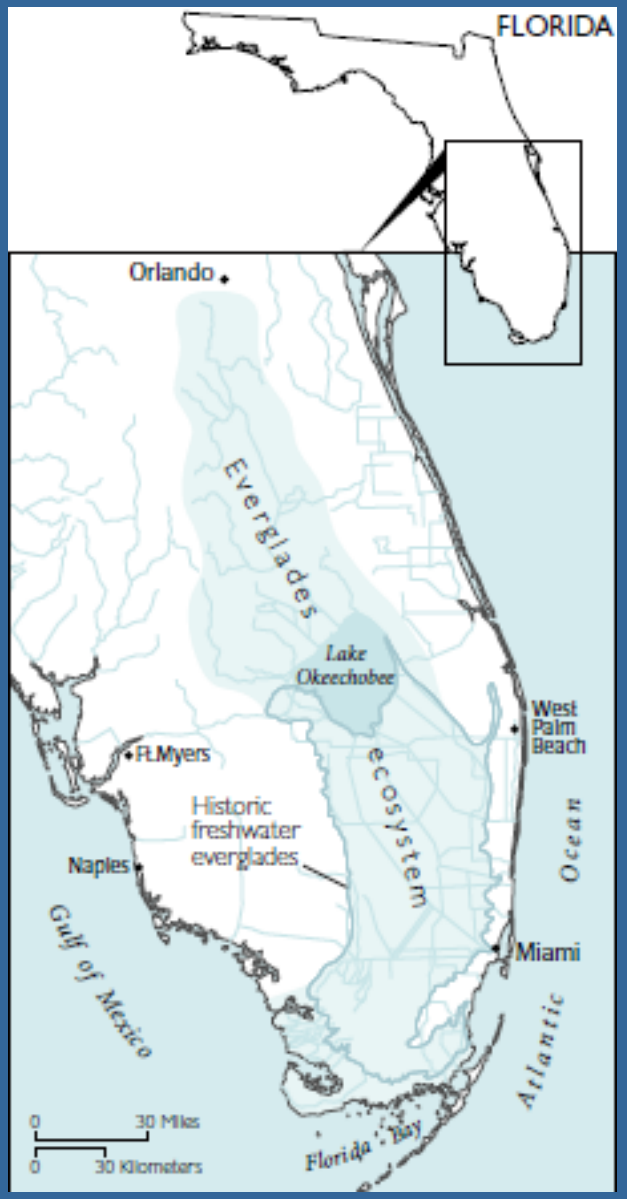
Photo: Robert D. Richard


Distribution of:
Tamarisk Leaf Beetle (Diorhabda carinulata)
Colorado Plateau - 2010
Interpreted Population Boundaries
Large Establishment (Defoliating Level)
Small Establishment (Pre-Defoliating)
Sample Locations
Beetle Presence
Absent (0)
Infrequent Individuals (1-4)
Small Establishment (5-25)
Large Establishment (26-500)
Vernal
Colorado
Utah
Green River
Grand Junction
I-15
I-70
Moab
Escalante
St. George
Page
Bluff
Cortez
Arizona
New Mexico
Flagstaff
I-40
0 25 50 100 150 200 Kilometers
0 15 30 60 90 120 Miles
Funding Provided By:
WALTON FAMILY FOUNDATION
TELLURIDE FOUNDATION
Kenney Brothers Foundation
Data Collected and Compiled By:
GIS Resources Provided By:
For a full list of data sources, please go to: www.tamariskcoalition.org
Published on: 10/29/10
Courtesy, the Tamarisk Coalition

Ecological Services of Weeds—Perch/Roost Sites

“It is difficult for one who has not seen the Everglades to form even an approximate idea of that far-extending expanse of sedge, with its stretches of shallow water, its scattered clumps of bushes and its many islands. Photographs fail to convey the impressions of distance, or remoteness, and of virgin wildness which strikes the visitor who for the first time looks out across that vast expanse.” —Samuel Sanford in Matson and Sanford, 1913

Loxahatchee NWR
Adam Fagen



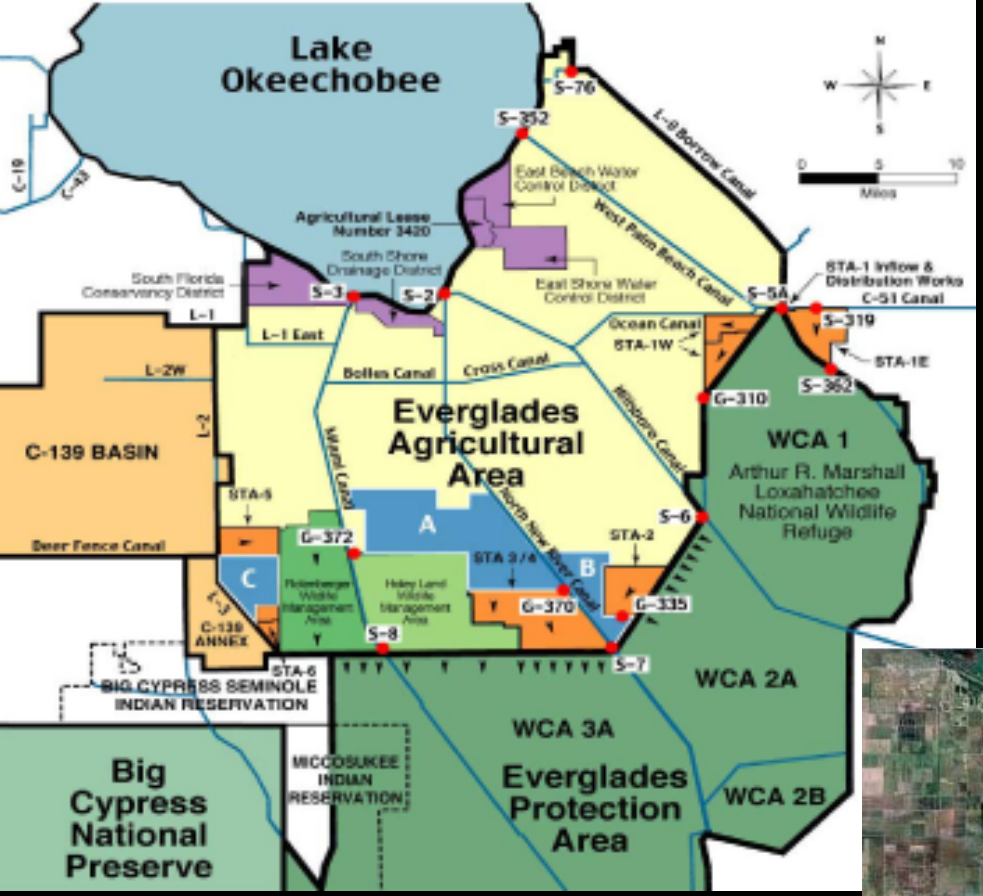
USGS

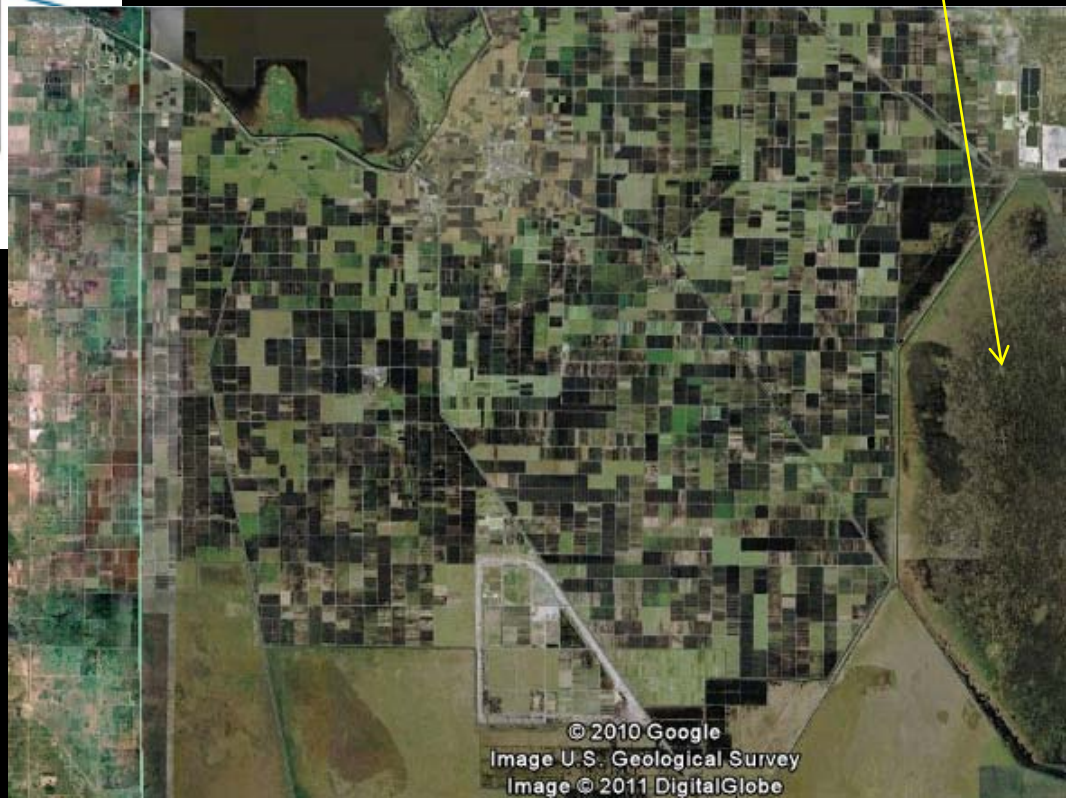
Ecological Services of Weeds—Perching, roosting, and nesting sites

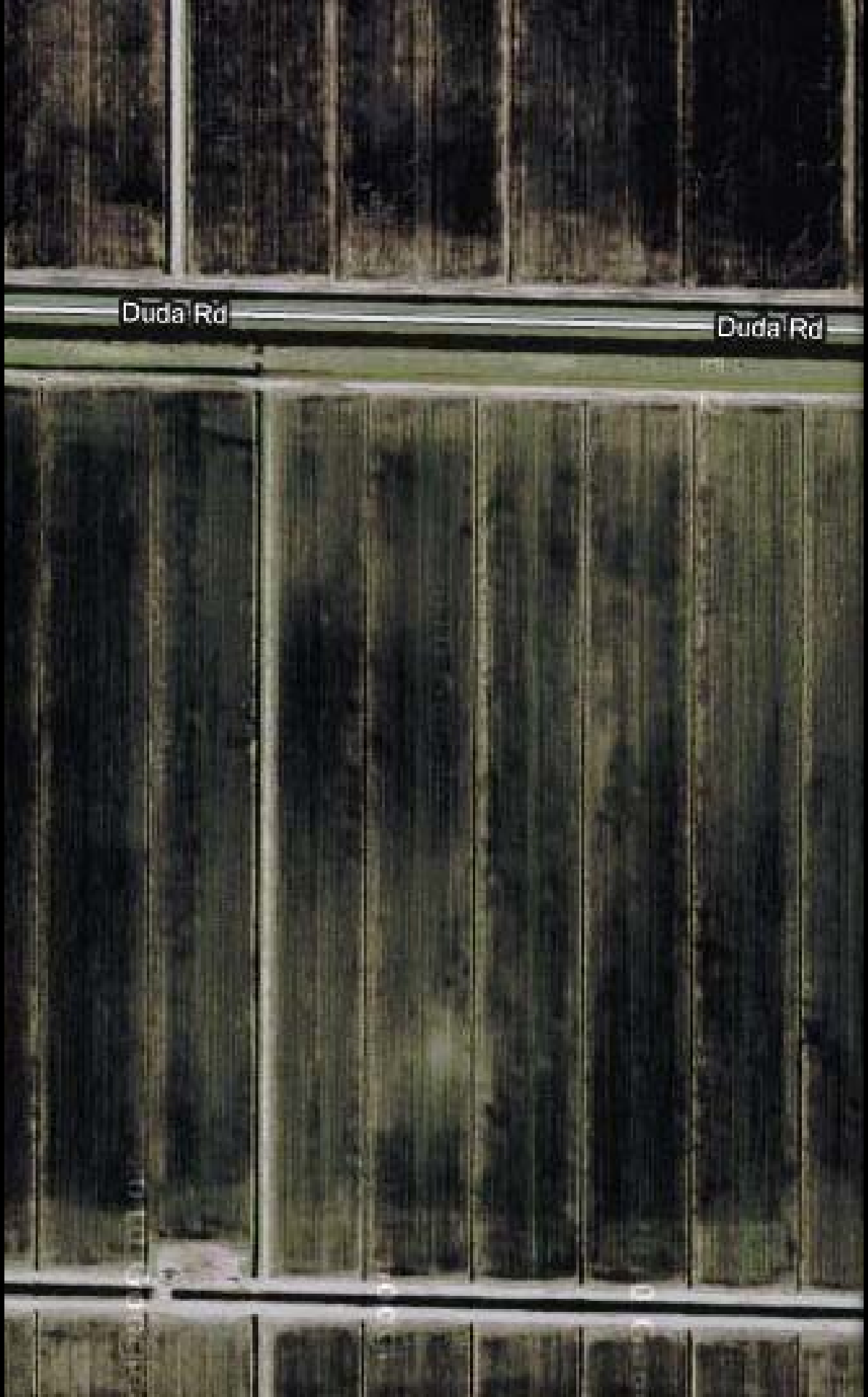
Florida: Everglades Agricultural Area—Where big trees are a critical resource

Non-native trees can also be significant providers of perching and nesting sites for wading birds and raptors, including the bald eagle.

Example and images courtesy of
Dr. Richard Raid,
Everglades Research and Education Center

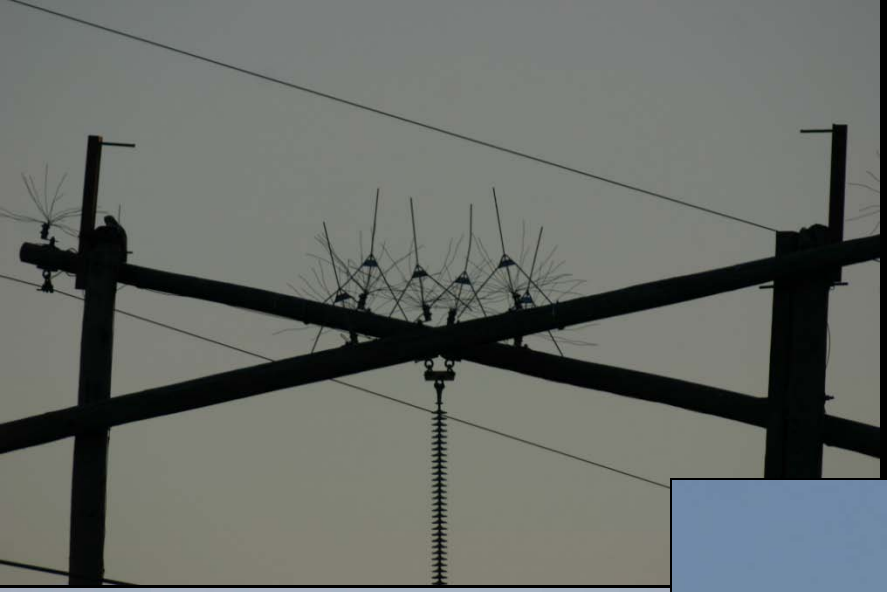

Lake Okeechobee
S-76
S-352
L-8 Borrow Canal
East Beach Water Control District
Agricultural Lease Number 3420
South Shore Drainage District
West Palm Beach Canal
South Florida Conservancy District
S-3
S-2
East Shore Water Control District
S-5A
STA-1 Inflow & Distribution Works
C-51 Canal
S-319
STA-1E
L-1
L-1 East
Ocean Canal
STA-1W
Bolles Canal
Cross Canal
S-362
G-310
L-2W
Everglades Agricultural Area
Hillsboro Canal
WCA 1
Arthur R. Marshall Loxahatchee National Wildlife Refuge
C-139 BASIN
L-2
STA-5
Miami Canal
A
S-6
Deer Fence Canal
G-372
STA-2
STA 3/4
B
C
G-370
G-335
L-3
C-139 ANNEX
S-8
S-7
STA-6
BIG CYPRESS SEMINOLE INDIAN RESERVATION
WCA 2A
WCA 3A
Big Cypress National Preserve
MICCOSUKEE INDIAN RESERVATION
Everglades Protection Area
WCA 2B
Miles


Loxahatchee NWR
© 2010 Google
Image U.S. Geological Survey
Image © 2011 DigitalGlobe

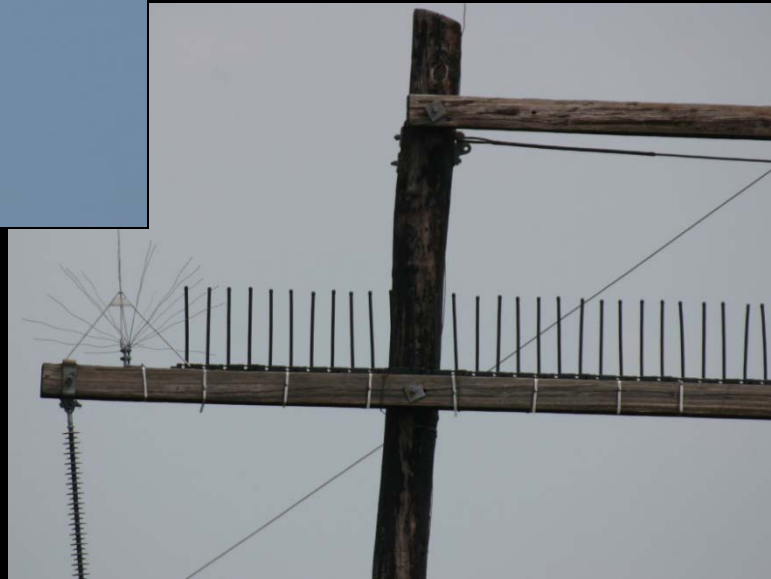

Duda Rd
Duda Rd

Brazilian peppertree
Schinus terebinthifolius
Anacardiaceae

Courtesy of Richard N. Raid



Courtesy of Richard N. Raid

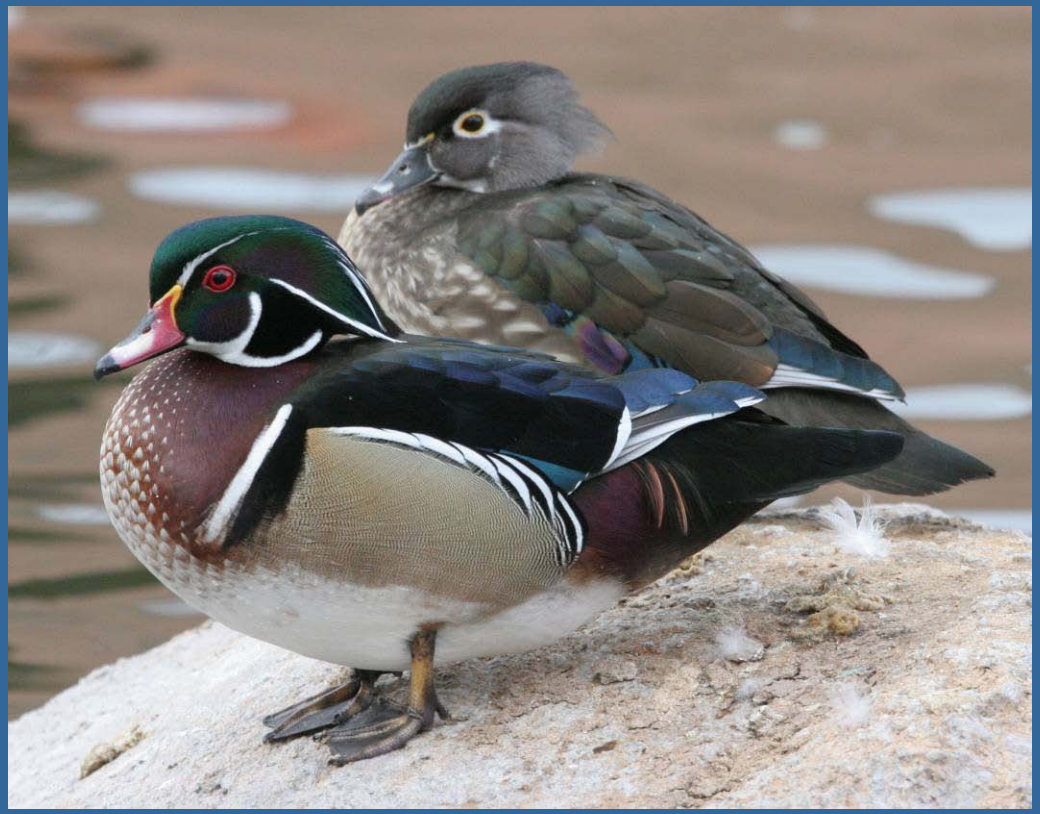


Melaleuca quinquenervia
Commonly called Melaleuca, punktree, and teatree
Allspice family, Myrtaceae

RUSSIAN-OLIVE USE BY BIRDS IN COLORADO

Elaeagnus angustifolia
Oleaster family, Elaeagnaceae

This example, the title of this segment, all but one image, & some slides courtesy of **Dave Leatherman**



SPECIES THAT COMMONLY EAT RUSSIAN-OLIVE

MORE SPECIES THAT COMMONLY EAT RUSSIAN-OLIVE

RUSSIAN-OLIVE SAP AS A FOOD SOURCE FOR BIRDS (AND INSECTS)

Yellow-bellied sapsucker, juvenile

Red-headed Ash Borer
(*Neoclytus caprea)*

Aphids, 4 species
Capitophorus eleagni
(photo courtesy of Andy Jensen)

SPECIES OBSERVED DIRECTLY ASSOCIATED WITH RUSSIAN-OLIVE IN LAMAR NOV. 2010

APHIDS

- Ruby-crowned Kinglet
- Golden-crowned Kinglet
- White-throated Sparrow
- Dark-eyed Junco
- Nashville Warblers
- Orange-crowned Warbler
- White-crowned Sparrow
- Warbling Vireo
- Yellow-rumped Warbler

OLIVES

- Red Fox Sparrow
- American Robin
- Northern Flicker
- Townsend's Solitaire
- Northern Cardinal
- Red-bellied Woodpecker
- European Starling
- Yellow-rumped Warbler
- White-throated Sparrow

Northern Pygmy-Owl

Long-eared owl

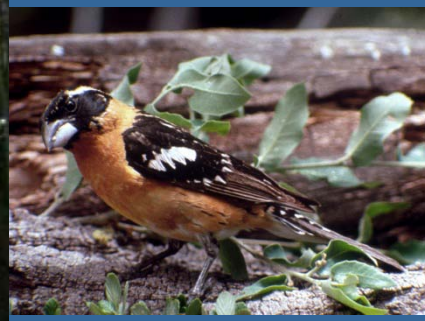
Rare birds seen by DL in RO

Varied Thrushes
Wood Thrushes
Prairie Warbler
Eastern Bluebirds
Long-eared Owls
Northern Pygmy-Owl
Sharp-tailed Grouse
Yellow-bellied Sapsuckers
Baltimore Oriole
Red Fox Sparrow
Brown-crested Flycatcher

Boulder example involving multiple eco-services

Boulder OSMP

Boulder OSMP




Boulder OSMP


Boulder OSMP


Boulder OSMP

McClintock & Bluebell drainages
2011 point counts

7 stations, 2X each
Early & late June

29 species, all native
6 rare or sensitive to disturbance
(Boulder County Nature Association)

Blue-gray Gnatcatcher
Black-headed Grosbeak
Grey Catbird
MacGillivray's Warbler
Virginia's Warbler
Red-breasted Nuthatch

→Foothills riparian shrublands support the highest breeding bird densities of any OSMP ecosystem.

All photos by Bill Schmoker

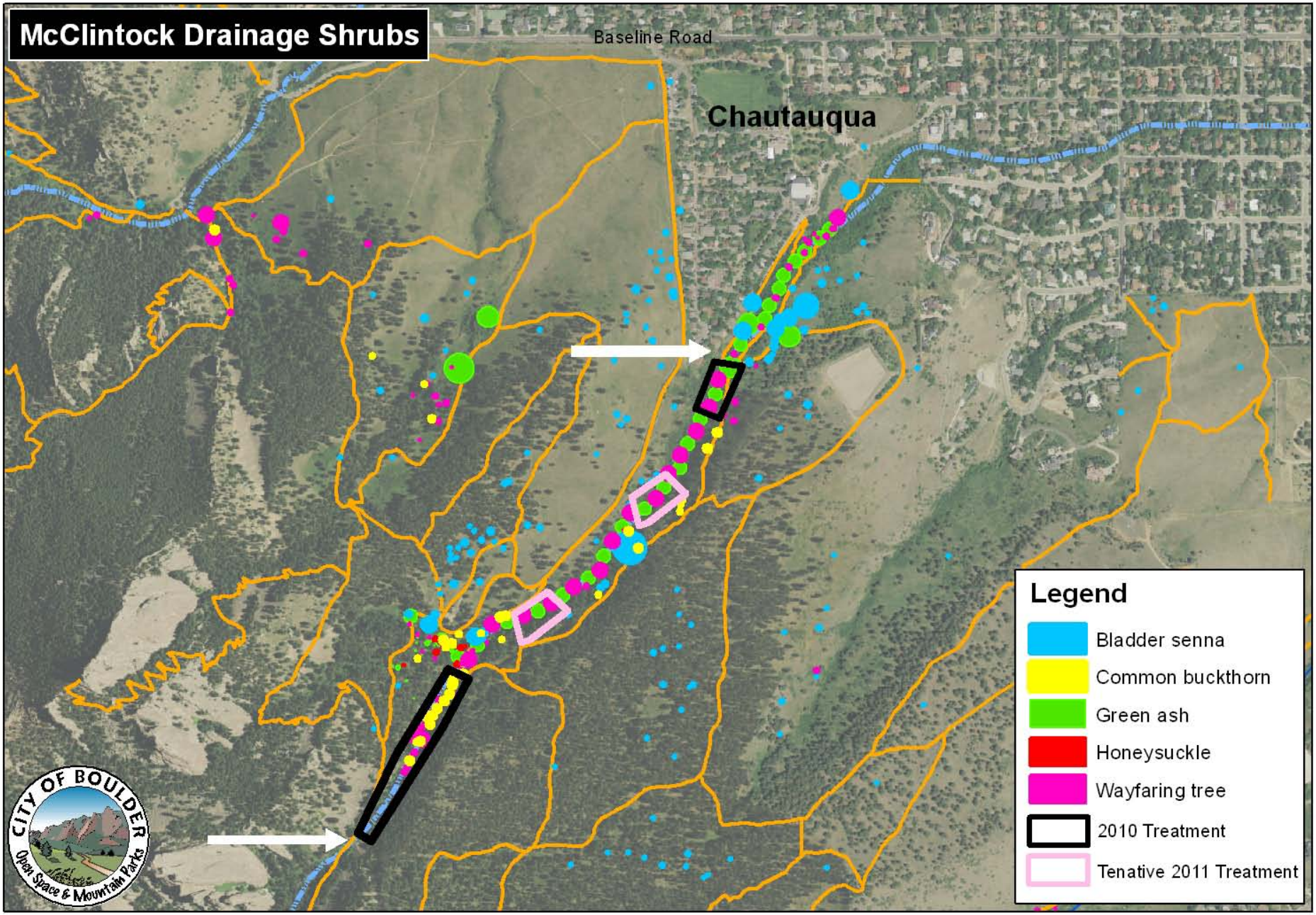
Targeted woody invasives

American privet
tree-of-heaven
bladder senna
common buckthorn
green ash
honeysuckle
wayfaring tree
apple trees?


Guy Padfield


Steven Sharnoff

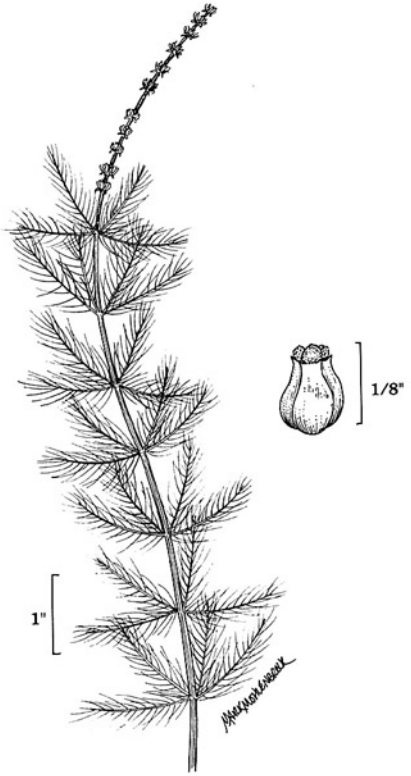

John Law

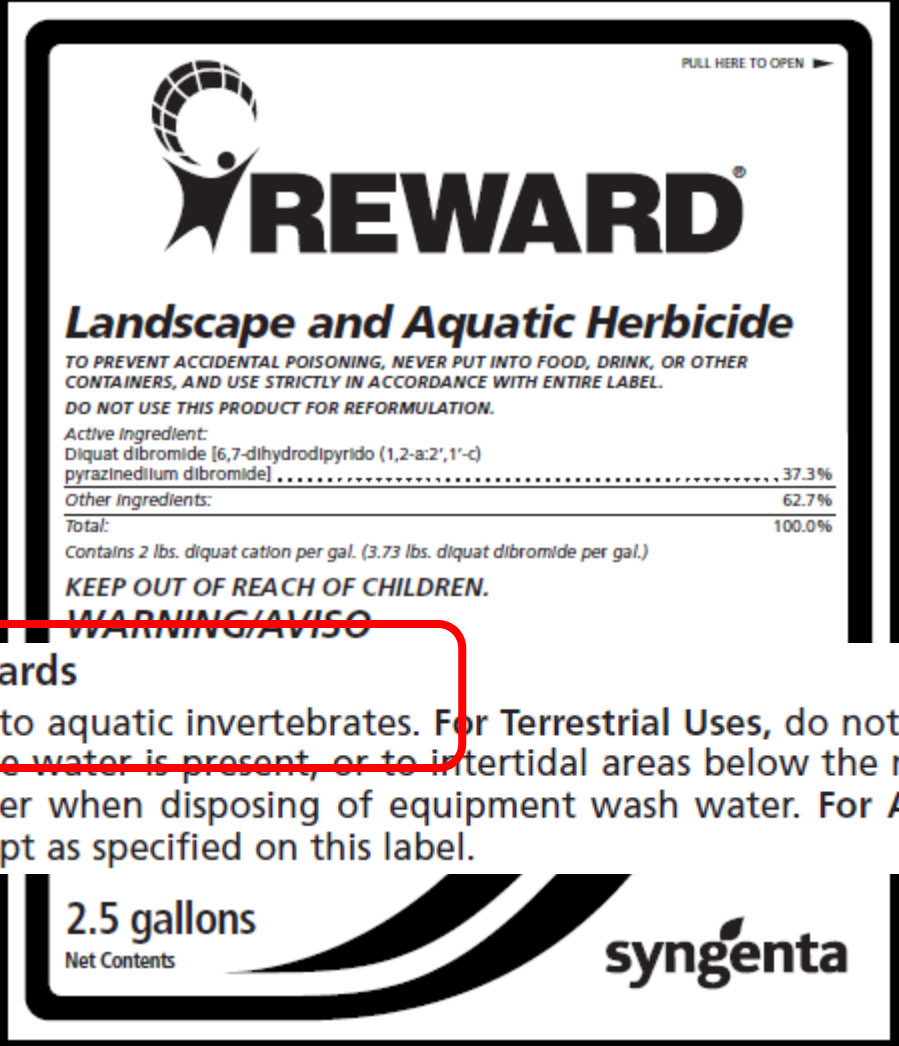

McClintock Drainage Shrubs
Baseline Road
Chautauqua
Legend
Bladder senna
Common buckthorn
Green ash
Honeysuckle
Wayfaring tree
2010 Treatment
Tenative 2011 Treatment
CITY OF BOULDER
Open Space & Mountain Parks

Aquatic example involving multiple eco-services

Eurasian water milfoil. *Myriophyllum spicatum*
USDA-NRCS PLANTS Database / USDA NRCS.
Wetland flora: Field office illustrated guide to plant species.

Colorado List B noxious weed





Environmental Hazards

This pesticide is toxic to aquatic invertebrates. **For Terrestrial Uses,** do not apply directly to water, or to areas where surface water is present, or to intertidal areas below the mean high water mark. Do not contaminate water when disposing of equipment wash water. **For Aquatic Uses** do not apply directly to water except as specified on this label.

Treatment of dense weed areas may result in oxygen loss from decomposition of dead weeds. This loss of oxygen may cause fish suffocation. Therefore, treat only 1/3 to 1/2 of the water body area at one time and wait 14 days between treatments.

For best results on submersed weeds, Reward Landscape and Aquatic Herbicide should be applied to actively growing (photosynthesizing) weeds when water temperatures have reached or exceeded approximately 50°F, typically during the Spring or early Summer.

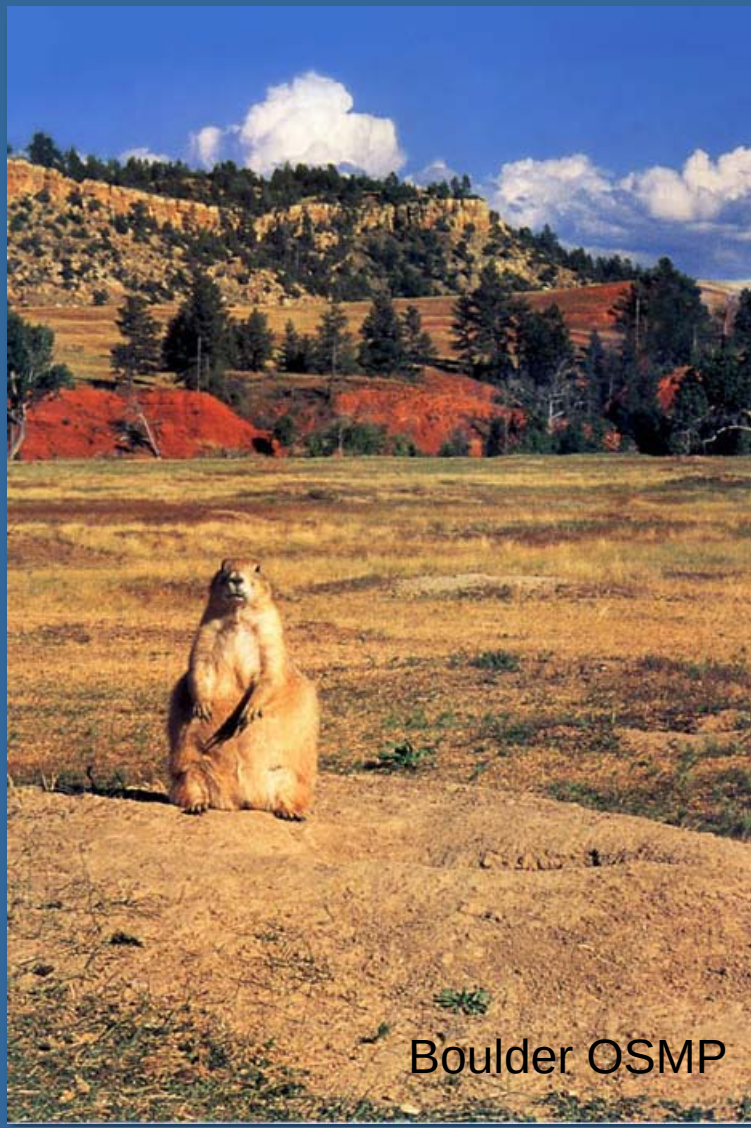
Basic Considerations in Aquatic Situations

- The target weed is a source of oxygen (and other ecological services)—what portion of the vegetation does the weed comprise?
- Will nontarget aquatic plants be affected by the treatment—how selective is the product or the application?
- A period of cloudy or overcast days is not a good choice since the oxygen levels are already reduced—important consideration with fast-acting chemicals
- If treat earlier in the season, there is less veg. to decompose . . . And cooler water temps . . .But, . . .
- Phasing can be critically important

Ecological Services of Weeds—Key points

Weed/vegetation managers should take into account or consider:

- Significance of the ES offered by the targeted weeds
- Status of affected animals (T/E/SofC)
- Availability of alternatives (food sources, etc.)
- Adjusting intensity of control methods
- Proportion, extent, scale of control, →phasing
- Timing of control measures
- Planting replacement native plants
- Other human activities
- Natural events/circumstances



Boulder OSMP

We suggest

Weed control and vegetation management folks should:

- Coordinate with wildlife folks

  And/or

- Assume some wildlife-related responsibilities

Terry Gray

Dual goals approach

‘Vegetation and weed management with wildlife in mind’

Heidi Genter


Crescent Lake NWR
Nebraska sand hills

Acknowledgements

Laurie Dieter, City of Boulder OSMP

Jay Eubanks (TN)

David Leatherman (CO)

Rick Raid, University of Florida

Stephen Young, University of Nebraska

Paul Winkle, Colorado Division of Wildlife

Crystal Yates-White (CO)

For more information
or to
suggest other examples of

‘Ecological services of weeds’
and
‘Vegetation management with wildlife in mind’

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jvickery_(at)_mcg.net